

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently amended) A semiconductor device comprising:

a gate electrode formed on an insulating surface;

a gate insulating film formed on the gate electrode; and

a source region, a drain region, and a channel forming region between the source region and the drain region, all these regions formed on and in contact with the gate insulating film;

an insulating film comprising silicon oxide film over the source region, a drain region and the channel forming region, and

wherein the gate insulating film has at least a silicon nitride film containing boron.

2. (Currently amended) A semiconductor device comprising:

an insulating film comprising a silicon nitride film containing boron over a substrate;

a source region, a drain region, and a channel forming region between the source region and the drain region, all these regions formed on and in contact with ~~an insulating surface~~ the insulating film;

a gate insulating film formed on the channel forming region; and

a gate electrode formed on and in contact with the gate insulating film;

wherein the gate insulating film has at least a silicon nitride film containing boron.

3-4 (Canceled).

5 (Previously presented). A semiconductor device according to claim 1, wherein the composition ratio of boron in the silicon nitride film is 0.1 to 50 atoms%.

6 (Previously presented). A semiconductor device according to claim 1, wherein the semiconductor device is an electro optical apparatus.

7 (Previously presented). A semiconductor device according to claim 1, wherein the semiconductor device is an electro optical apparatus selected from a liquid crystal display, an EC display and an image sensor.

8 (Previously presented). A semiconductor device according to claim 1, wherein the semiconductor device is an EL display.

9 (Previously presented). A semiconductor device according to claim 1, wherein the semiconductor device is an electronic apparatus selected from a video camera, a digital camera, a projector, a goggle display, a car navigation, a personal computer and a portable information terminal.

10-17 (Canceled).

18 (Original). A semiconductor device according to claim 2, wherein the composition ratio of boron in the silicon nitride film is 0.1 to 50 atoms%.

19-20 (Canceled).

21 (Previously presented). A semiconductor device according to claim 2, wherein the semiconductor device is an electro optical apparatus.

22-23 (Canceled).

24 (Original). A semiconductor device according to claim 2, wherein the semiconductor device is an electro optical apparatus selected from a liquid crystal display, an EC display and an image sensor.

25-26 (Canceled).

27 (Original). A semiconductor device according to claim 2, wherein the semiconductor device is an electronic apparatus selected from a video camera, a digital camera, a projector, a goggle display, a car navigation, a personal computer and a portable information terminal.

28-29 (Canceled).

30 (Previously presented). A semiconductor device according to claim 1 wherein the semiconductor device is an electronic apparatus.

31 (Previously presented). A semiconductor device according to claim 2 wherein the semiconductor device is an electronic apparatus.

32 (Previously presented). A semiconductor device comprising:

a substrate;

a gate electrode formed over the substrate;

a gate insulating film formed over the gate electrode, wherein the gate insulating film comprises silicon nitride and boron;

an amorphous semiconductor film formed on the gate insulating film wherein the amorphous semiconductor film includes a channel region; and

an insulating layer formed on the amorphous semiconductor film, wherein the insulating layer comprises silicon nitride and boron.

33 (Previously presented). The semiconductor device according to claim 32 wherein a concentration of boron in the gate insulating film is 0.1 to 10 atom%.

34 (Previously presented). The semiconductor device according to claim 32 wherein a concentration of boron in the insulating layer is 0.1 to 10 atom%.

35 (Previously presented). The semiconductor device according to claim 32 wherein said semiconductor device is an EL display.

36 (Previously presented). The semiconductor device according to claim 32 wherein the semiconductor device is an electronic apparatus selected from a video camera, a digital camera, a projector, a goggle display, a car navigation, a personal computer and a portable information terminal.

37-41 (Canceled).

REMARKS

Request For Reconsideration In Light of Prior Amendment

Applicant addressed each of the Examiner's rejections in the order in which they appear in the Final Rejection in Amendment C filed on June 25, 2003 (a RCE being filed herewith to ensure that Amendment C is entered in this application). Applicant believes that the arguments made therein show how the claimed invention is clearly patentable over the cited references. Accordingly, Applicant incorporates these arguments herein and requests that the Examiner reconsider the rejections of the claims in light of these arguments.

For the Examiner's benefit, Applicant is repeating these arguments below along with additional arguments:

I. Claim Rejections - 35 USC §102

In the Final Rejection, the Examiner rejects Claims 1 and 2 under 35 USC §102(b) as being anticipated by Sukegawa (JP 4367277). This rejection is respectfully traversed.

Claim 1

The present invention, as recited, for example, in amended independent Claim 1, is directed to a semiconductor device comprising

a gate electrode formed on an insulating surface;
a gate insulating film formed on the gate electrode; and
a source region, a drain region, and a channel forming region
between the source region and the drain region, all these regions
formed on and in contact with the gate insulating film;
an insulating film comprising silicon oxide film over the
source region, a drain region and the channel forming region, and
wherein the gate insulating film has at least a silicon nitride
film containing boron.

The Examiner argues that Sukegawa discloses the claimed invention and contends that Sukegawa discloses a source region 7, a drain region 6 and a channel forming region 9 between the source region and the drain region, and that all these regions are formed on and in contact with a gate insulating film 3, wherein the gate insulating film has one layer of a silicon nitride film 8 containing boron.

Applicant notes, however, that in Fig. 1 of Sukegawa, the source region and the drain region are in contact with an n+ type a-Si film 5, and the channel forming region is in contact with a part of an a-Si film 4.

If layer 3 in Sukegawa is a gate insulating film, then all of these regions are not formed on and in contact with the gate insulating film, as required in independent Claim 1. For example, layer 9 is not formed in contact with gate insulating film 3. Further, gate insulating layer 3 does not have at least a silicon nitride film containing boron, as required in Claim 1. Layer 8 cited by the Examiner is not the gate insulating film defined in the claims. The gate insulating film in Claim 1 is the film for which the source region, drain region and channel forming region are formed on and in contact with. Hence, since layer 8 does not fall within this definition in the claim and layer 3 does not have boron, Sukegawa does not disclose or suggest the claimed invention.

While Applicant believes that the above prior response is sufficient to overcome the Examiner's rejection of Claim 1, in order to ensure the advancement of this application, Applicant is amending Claim 1 to include "an insulating film comprising silicon oxide film over the source region, a drain region and the channel forming region". No such insulating film is disclosed or suggested by Sukegawa.

Therefore, for at least the above-stated reasons, independent Claim 1 is clearly not disclosed or suggested by the cited reference but is patentable thereover.

Claim 2

Independent Claim 2 recites a top gate structure thin film. In contrast, Sukegawa discloses an inverse stagger structure thin film transistor. Hence, the reference does not disclose or suggest this claimed invention.

Further, in order to advance the prosecution of this claim, Applicant is amending Claim 2 to include “an insulating film comprising a silicon nitride film containing boron over a substrate.” Applicant respectfully submit that this feature is not disclosed or suggested by Sukegawa.

Therefore, for at least the above-stated reasons, independent Claim 2 is clearly not disclosed or suggested by the cited reference but is patentable thereover.

Accordingly, independent Claims 1 and 2 and those claims dependent thereon are patentable over the cited reference. Therefore, it is respectfully requested that this rejection now be withdrawn.

II. Claim Rejections - 35 USC §103

A. Rejections Over Sukegawa

The Examiner also has the following rejections of the following claims over Sukegawa:

- (i) Claims 5 and 20 under 35 USC §103 as being unpatentable over Sukegawa in view of Nguyen et al.;
- (ii) Claims 6-9, 30-31 are rejected as being unpatentable under Sukegawa, in view of Yamazaki et al.;
- (iii) Claims 32-34 are rejected as being unpatentable over Sukegawa, in view of Furuta et al.; and

- (iv) Claims 35-36 are rejected as being unpatentable over Sukegawa, in view of Furuta et al. in further view of Yamazaki et al.

For the reasons discussed above for independent Claims 1 and 2, each of these claims is also not disclosed or suggested by the cited references and therefore is patentable thereover. Accordingly, it is requested that these rejections now be withdrawn.

B. Rejections Over Takemura in view of Treichel

The Examiner further rejects Claims 1, 2, 6, 9, 21, 24, 27 and 31 under 35 USC §103 as being unpatentable over Takemura in view of Treichel et al. and Claims 18-19 under 35 USC §103 as being unpatentable over Takemura in view of Treichel et al. and further in view of Nguyen et al. Both of these rejections are respectfully traversed.

As the Examiner admits, Takemura does not “explicitly teach the interlayers being made of silicon boronitride.” The Examiner, however, asserts that “it would have been obvious to one skilled in the art at the time the invention was made to construct the invention of Takemura with the silicon boronitride layers, as taught by Treichel et al.”

Applicant respectfully disagrees. Treichel does not appear to disclose or suggest using boronitride layers for the gate insulating film or for a thin film transistor. Hence, even if it were proper to combine such references, which Applicant does not concede, such a combination would still fail to disclose the semiconductor device of the claimed invention wherein “the gate insulating film has at least a silicon nitride film containing boron”.

Further, it is not seen where Takemura discloses or suggests, for example, a source region, a drain region, and a channel forming region between the source region and the drain region, all these regions formed on and in contact with the gate insulating film, as recited in Claim 1.

Hence, the claims of the present application are patentable over the cited references and should be allowed. Accordingly, it is requested that these rejections be withdrawn.

III. Conclusion

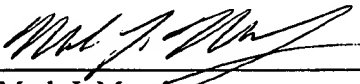
For at least the above stated reasons, the claims of the present application are in a condition for allowance and should now be allowed.

If any further fee is due for this amendment, please charge our deposit account 50/1039.

Favorable reconsideration is earnestly solicited.

Respectfully submitted,

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Mark J. Murphy
Registration No. 34,225

COOK, ALEX, McFARRON, MANZO,
CUMMINGS & MEHLER, LTD.
200 West Adams Street
Suite 2850
Chicago, Illinois 60606
(312) 236-8500